550285

FLOOD INSURANCE STUDY

CITY OF WEST ALLIS, WISCONSIN

MILWAUKEE COUNTY

OCTOBER 15, 1980

federal emergency management agency

federal insurance administration

COMMUNITY NUMBER - 550285

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index

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FLOOD INSURANCE STUDY

CITY OF WEST ALLIS,
MILWAUKEE COUNTY, WISCONSIN

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of West Allis, Milwaukee County, Wisconsin, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of West Allis to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Carl C. Crane, Inc., for the Federal Insurance Administration, under Contract No. H-4531. This study was completed in October 1978.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the Study Contractor, the FIA, the Wisconsin Department of Natural Resources (DNR), and representatives of the City of West Allis on May 13, 1977. The limits of the detailed studies in West Allis were determined by the FIA with the community and the Study Contractor at an intermediate meeting in May 1977. Results of the hydrologic analyses were coordinated with the Southeastern Wisconsin Regional Planning Commission; the DNR, Flood Plain Management Section; and the Engineering Department of the City of West Allis.

On July 19, 1979, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the FIA, the Study Contractor, and the City of West Allis.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of West Allis. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through October 1983.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the FIA and the City of West Allis.

The flooding sources studied by detailed methods are listed below:

a. the Root River from the southern corporate limit at West Morgan Avenue to just south of West Lincoln Avenue;

b. the West Branch Root River from its mouth at Root River to a point just downstream of the western corporate limit; and

c. Hale Creek from its confluence with the Root River to approximately 2,200 feet upstream of West Cleveland Avenue.

Flooding from the Root River, in the annexation along south 116 Street approximately 700 feet downstream of West Morgan Avenue, was taken directly from the detailed study in the City of Greenfield Flood Insurance Study.

Each of the three flooding sources was studied by approximate methods for a short distance upstream of the detailed study. Hale Creek was studied by approximate methods from the upstream limit of detailed study to West Lincoln Avenue.

2.2 Community Description

The City of West Allis is located in the southeastern portion of Wisconsin in the west-central portion of Milwaukee County. The City of West Allis is bordered on the north by the Cities of Wauwatosa and Milwaukee, on the east by the Cities of West Milwaukee and Milwaukee, on the south by the Cities of Greenfield and Milwaukee, and on the west by the Cities of Elm Grove and New Berlin, both of which are in Waukesha County. The total land area contained within the city limits of West Allis is 11.36 square miles. West Allis was incorporated in 1906. In 1970, the population was listed as 71,649 (Reference 1).

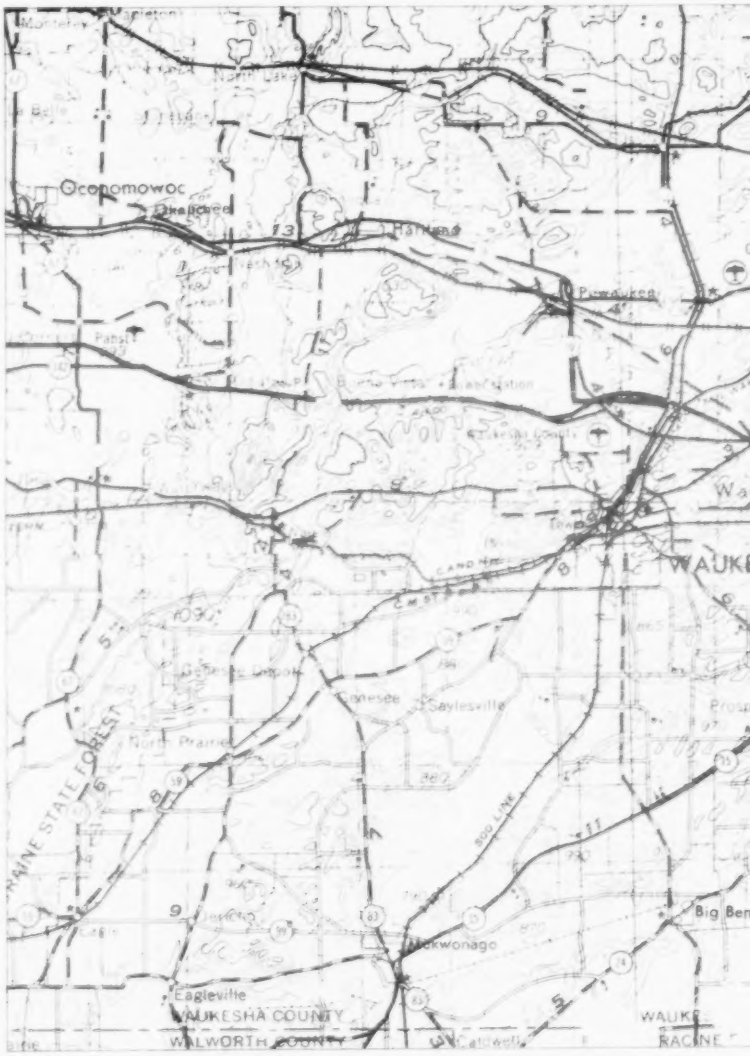

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

Federal Insurance Administration

CITY OF WEST ALLIS, WI

(MILWAUKEE CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

The climate in southeastern Wisconsin is characteristically mild. Mean summer and winter temperatures range from 73 degrees Fahrenheit (F.) to 13 degrees F., respectively. Annual average precipitation of the region is 30.0 inches with an average recorded snowfall of 43 inches. Precipitation is normally higher in the spring and summer (Reference 1).

The surface of Milwaukee County is a gently undulating plain, without prominent relief, which slopes eastward toward Lake Michigan. The county is drained by the Milwaukee and Menominee Rivers, which flow into the lake at Milwaukee and the Root River, which flows into the lake at Racine. The geological conditions consist mainly of Niagara Limestone with some beds of Devonian shale overlying the Niagara (Reference 2).

The Root River and the West Branch Root River flow southerly through the city. Hale Creek, a tributary of the Root River, also flows south through the city.

About 55 percent of the total acreage of West Allis is in residential use with approximately 15 percent in recreational use, 5 percent open lands, and the remainder in all other uses including commercial, industrial, and transportation. The Root River flood plains are undeveloped and those of Hale Creek and West Branch Root River are residentially developed.

2.3 Principal Flood Problems

The history of flooding on the streams within the City of West Allis indicates that flooding may occur during any season of the year. The Root River, and the West Branch Root River at West Allis and Hale Creek are small basins and, therefore, responsive to locally heavy rains. Floods can occur on these creeks during any of the warmer months of the year but especially during early spring due to the combination of spring rains and snowmelt. There are no gage records available for either the Root River or Hale Creek.

2.4 Flood Protection Measures

No notable improvements have been made to the Root River, the West Branch Root River, or Hale Creek, which would reduce the flooding potential in the City of West Allis. Due to the increase of development and urbanization in the area, actual runoff has increased and, thereby, added to the flooding potential.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the

recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

For the Root River and Hale Creek, discharges were developed by the Southeastern Wisconsin Regional Planning Commission using the rational method (Reference 3). The 500-year discharges for these streams were developed by the Study Contractor by utilizing that data. A straight line extrapolation of the more frequent events plotted on log-probability paper was used by the Study Contractor to develop the 500-year discharge (Q). Discharges for the West Branch Root River were developed using statistical rainfall data and synthetic unit hydrographs derived from basin characteristics. There are no gage stations on this river. These discharges are based upon 1978 land use conditions. As the basins are developed and channels are improved, increased flows are imminent unless provisions are made to maintain peaks at their present levels (References 4, 5, and 6). Upstream of the culvert under West Oklahoma Avenue, a loss of flow occurs. During a 100-year flood, 160 cubic feet per second (cfs) of water overtop the stream bank and flow overland to the Root River. The remaining flow is contained in the channel and passes through the culvert to the Root River.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Cross sections for the backwater analyses of the West Branch Root River were obtained from photograph maps having a scale of 1:2400, with a contour interval of two feet (Reference 7). The channel soundings were estimated from invert elevations measured at bridge and culvert locations. Cross sections and below-water sections for the Root River and for Hale Creek were obtained from Southeastern Wisconsin Regional Planning Commission data.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA SQ MILES	PEAK DISCHARGES (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
ROOT RIVER					
Upstream of West Morgan Avenue	5.52	1,932	2,507	2,763	3,400
Upstream of the mouth of Hale Creek	1.87	643	797	886	1,100
HALE CREEK					
Upstream of its mouth with the Root River	1.86	1,112	1,589	1,759	2,200
WEST BRANCH ROOT RIVER					
Upstream of Oklahoma Avenue	1.79	580	840	960	1,200

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Roughness values for the main channel of the Root River range from 0.015 to 0.061 with flood plain roughness values ranging from 0.030 to 0.080 for all floods. Roughness values for the main channel of Hale Creek range from 0.015 to 0.055 with flood plain roughness values ranging from 0.03 to 0.06. Roughness values for the West Branch Root River are 0.045 for the channel and range from 0.055 to 0.1 for the flood plain.

Starting water-surface elevations for the Root River at the southern corporate limit were obtained from the profiles for the City of Greenfield developed by the Southeastern Wisconsin Regional Planning Commission. Starting water-surface elevations for Hale Creek were obtained from its mouth at Root River. For West Branch Root River, starting water-surface elevations were developed using rating curves for the upstream end of the culvert at West Oklahoma Avenue. Water-surface elevations through the culvert were calculated by hand using Manning's formula. The loss of flow upstream of the culvert was taken into account in these calculations. For each flooding source, water-surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 8). Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

Elevations for approximate study areas were determined using the Flood Hazard Boundary Map (Reference 9) and engineering judgment.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using topographic maps at a scale of 1:2400, with a contour interval of two feet (Reference 7). Boundaries for approximate study areas were delineated using topographic maps (Reference 7), the Flood Hazard Boundary Map (Reference 9), and engineering judgment. The 100-, and 500-year flood boundaries in the annexation on South 116 Street, about 600 feet downstream of West Morgan Avenue on the Root River, were taken directly from the City of Greenfield Flood Insurance Study (Reference 10).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. In addition, the DNR is required under Wisconsin Administrative Code Chapter NR 116 (Reference 11) to establish minimum standards for local flood plain zoning ordinances. The DNR has established a policy that limits encroachment in the flood plain to that which will not cause any significant increase in flood heights. Exceptions are possible under special circumstances and with the concurrence of the DNR. Thus, a floodway having a surcharge of 0.1 foot has been delineated for this study.

The floodways in this study were developed to reflect the existing effective flow limits using topographic maps (Reference 7). The floodways and the 100-year boundary are the same, except for areas of little or no conveyance. In these areas, the floodway was smoothed out using topographic maps and engineering judgment. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
ROOT RIVER								
A	213,259	1440	3311	0.8	731.3	731.3	731.3	0.0
B	213,729	1338	4289	0.6	731.5	731.5	731.5	0.0
C	213,994	1257	3926	0.7	731.6	731.6	731.6	0.0
D	214,526	1234	1899	1.5	731.7	731.7	731.7	0.0
E	215,001	909	2593	1.1	732.0	732.0	732.0	0.0
F	215,318	793	2150	1.3	732.3	732.3	732.3	0.0
G	215,740	577	1246	1.7	732.7	732.7	732.7	0.0
H	216,268	241	595	3.3	733.6	733.6	733.6	0.0
I	216,638	241	801	2.4	734.2	734.2	734.2	0.0
J	216,955	410	1330	1.5	734.6	734.6	734.6	0.0
K	217,355	503	1737	1.1	734.9	734.9	734.9	0.0
L	218,015	549	1518	1.3	735.2	735.2	735.2	0.0
M	218,486	348	411	4.3	735.9	735.9	735.9	0.0
N	218,908	433	999	1.8	737.6	737.6	737.6	0.0
O	219,225	317	431	4.1	738.2	738.2	738.2	0.0
P	219,806	204	562	2.1	743.1	743.1	743.1	0.0
Q	220,334	402	855	1.4	743.7	743.7	743.7	0.0
R	220,862	436	247	4.8	744.8	744.8	744.8	0.0
S	221,284	321	440	2.7	747.5	747.5	747.5	0.0
T	221,812	340	510	2.3	749.7	749.7	749.7	0.0
U	222,129	202	334	2.9	752.0	752.0	752.0	0.0
V	222,763	282	353	2.7	755.3	755.3	755.3	0.0
W	223,132	178	239	4.1	756.1	756.1	756.1	0.0

[1]FEET ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF WEST ALLIS, WI
(MILWAUKEE CO.)

FLOODWAY DATA

ROOT RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
WEST BRANCH ROOT RIVER								
A	1725	31	407	2.4	735.6	735.6	735.6	0.0
B	2112	39	151	6.4	736.3	736.3	736.3	0.0
C	2798	64	135	7.1	742.5	742.5	742.5	0.0
D	3485	230	380	2.5	747.1	747.1	747.1	0.0
E	3960	199	315	3.0	748.6	748.6	748.6	0.0
F	4224	44	107	8.9	750.2	750.2	750.2	0.0
HALE CREEK								
A	402	126	469	1.9	735.5	735.5	735.5	0.0
B	772	156	544	1.6	735.7	735.7	735.7	0.0
C	1002	130	536	1.7	735.9	735.9	735.9	0.0
D	1302	276	928	1.0	736.0	736.0	736.0	0.0
E	1535	180	650	1.4	736.1	736.1	736.1	0.0
F	1695	160	840	1.1	736.1	736.1	736.1	0.0
G	2015	180	629	1.5	736.2	736.2	736.2	0.0
H	2395	120	452	2.1	736.4	736.4	736.4	0.0
I	3045	52	254	2.8	736.8	736.8	736.8	0.0
J	3565	69	334	2.1	737.2	737.2	737.2	0.0
K	4565	57	216	3.2	737.6	737.6	737.6	0.0
L	4835	40	191	3.7	737.7	737.7	737.7	0.0

[1]FEET ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF WEST ALLIS, WI
(MILWAUKEE CO.)

FLOODWAY DATA

WEST BRANCH ROOT RIVER - HALE CREEK

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 0.1 at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

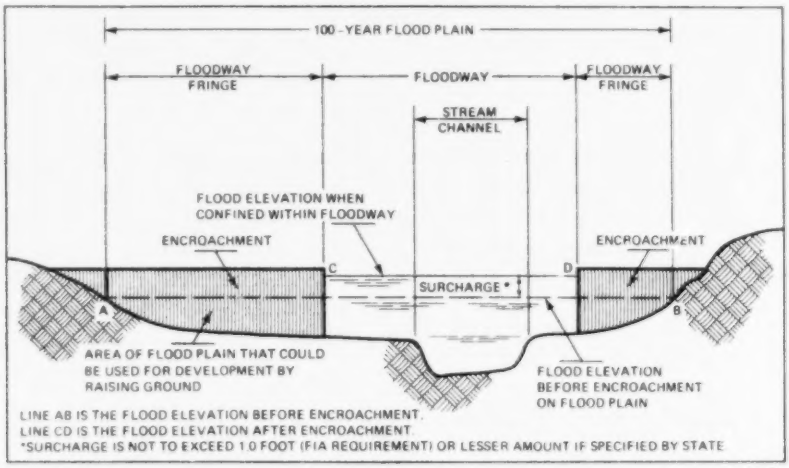
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the City of West Allis.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the City of West Allis are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of West Allis was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A1, A2, A3:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood,

including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of West Allis is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

The Flood Insurance Studies for the City of Greenfield, the City of Wauwatosa, and the City of New Berlin are in complete agreement with this study (References 10, 12, and 13).

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 9). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, One North Dearborn Street, Chicago, Illinois 60602.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
ROOT RIVER							
REACH 1[4]	0003	–1.4	–0.5	0.9	015	A3	VARIES–SEE MAP
REACH 2	0003	–0.5	–0.2	0.3	005	A1	VARIES–SEE MAP
WEST BRANCH ROOT RIVER							
REACH 1	0003	–1.2	–0.4	0.7	010	A2	VARIES–SEE MAP
HALE CREEK							
REACH 1	0003	–0.8	–0.3	0.6	010	A2	VARIES–SEE MAP

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT
[4] DATA FOR THIS REACH TAKEN FROM CITY OF GREENFIELD, WISCONSIN FIS

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
CITY OF WEST ALLIS, WI
(MILWAUKEE CO.)

FLOOD INSURANCE ZONE DATA

ROOT RIVER - WEST BRANCH ROOT RIVER - HALE CREEK

8.0 REFERENCES AND BIBLIOGRAPHY

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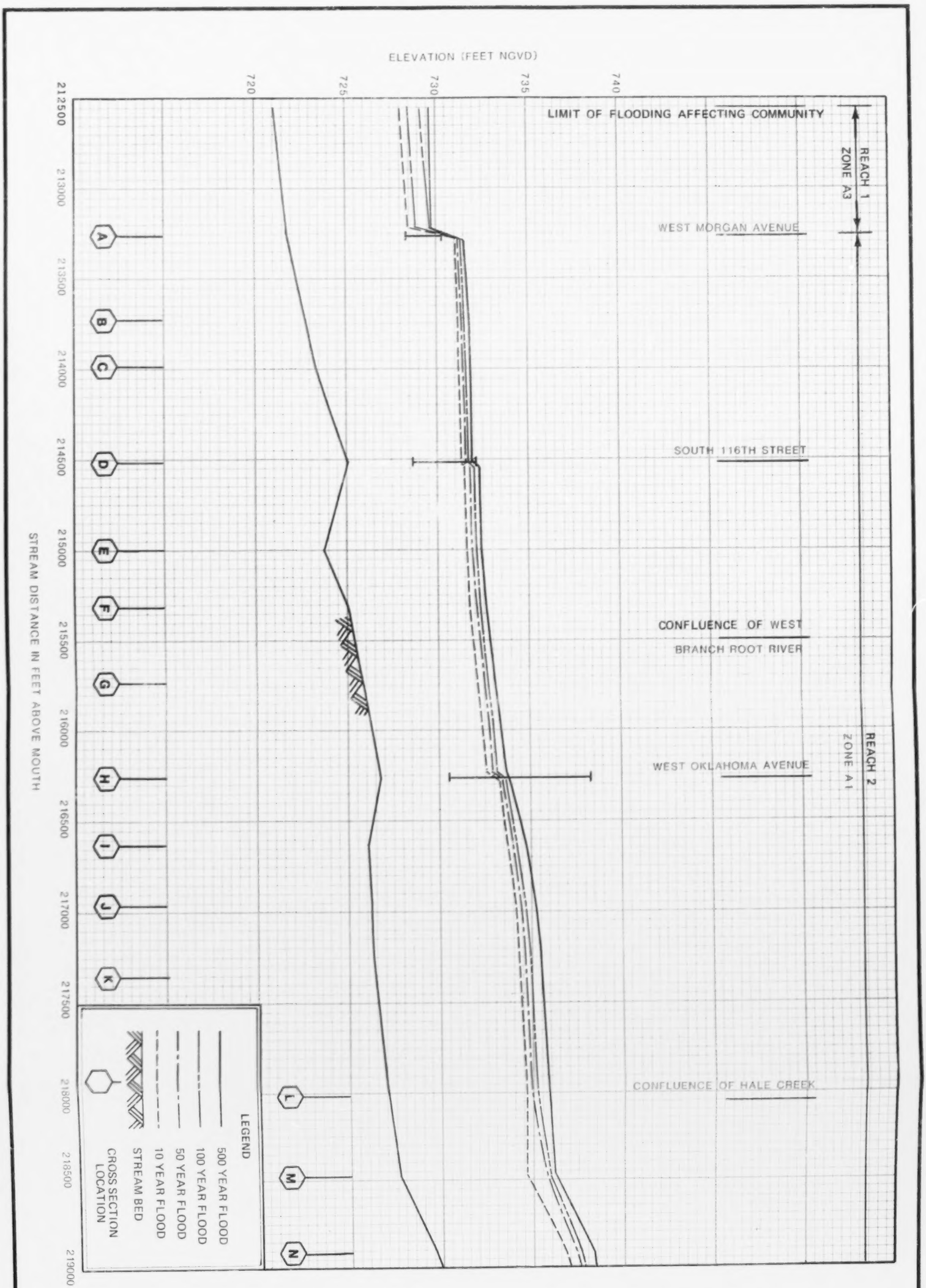


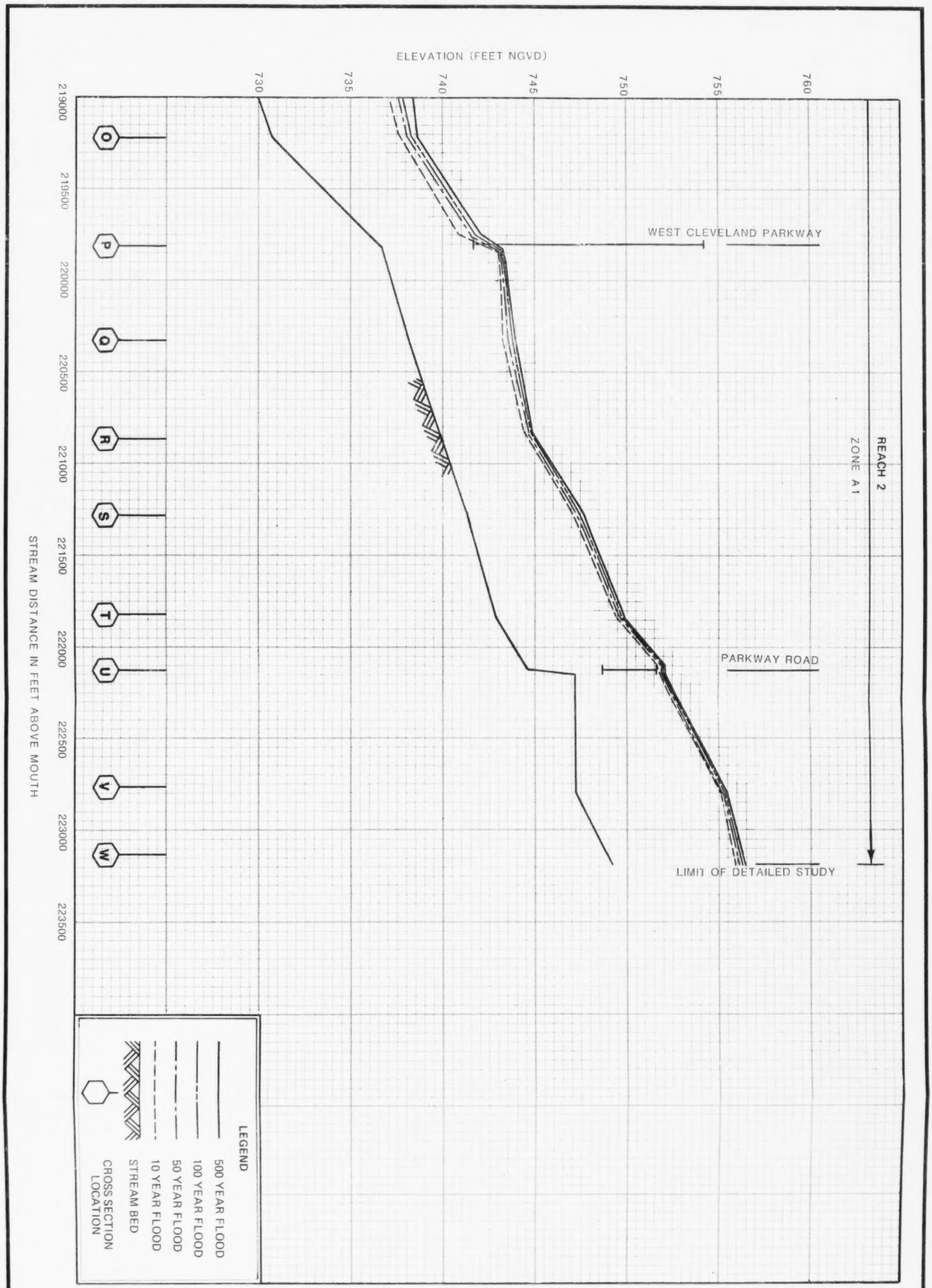
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF WEST ALLIS, WI
(MILWAUKEE CO.)

FLOOD PROFILES

ROOT RIVER

01P



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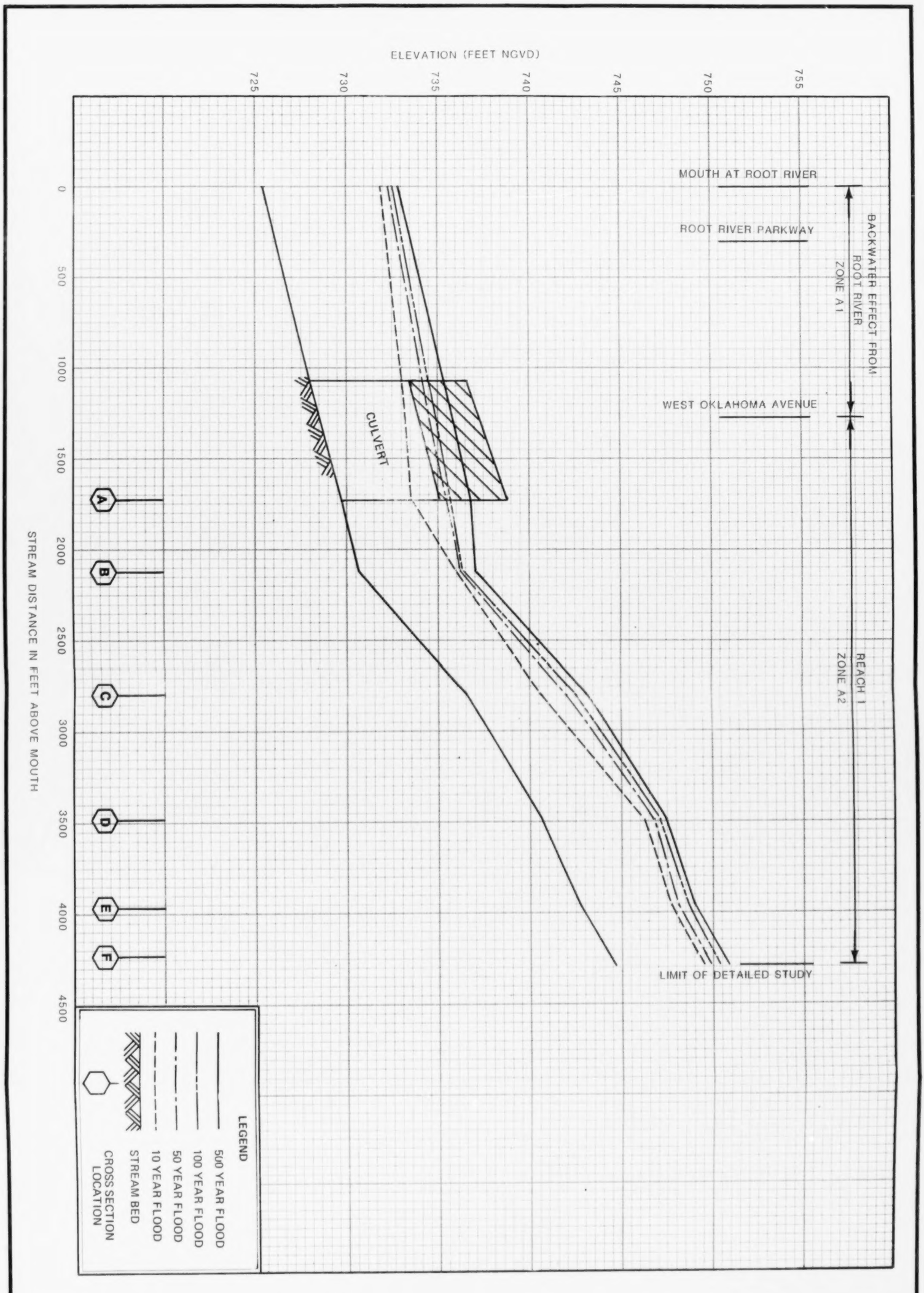

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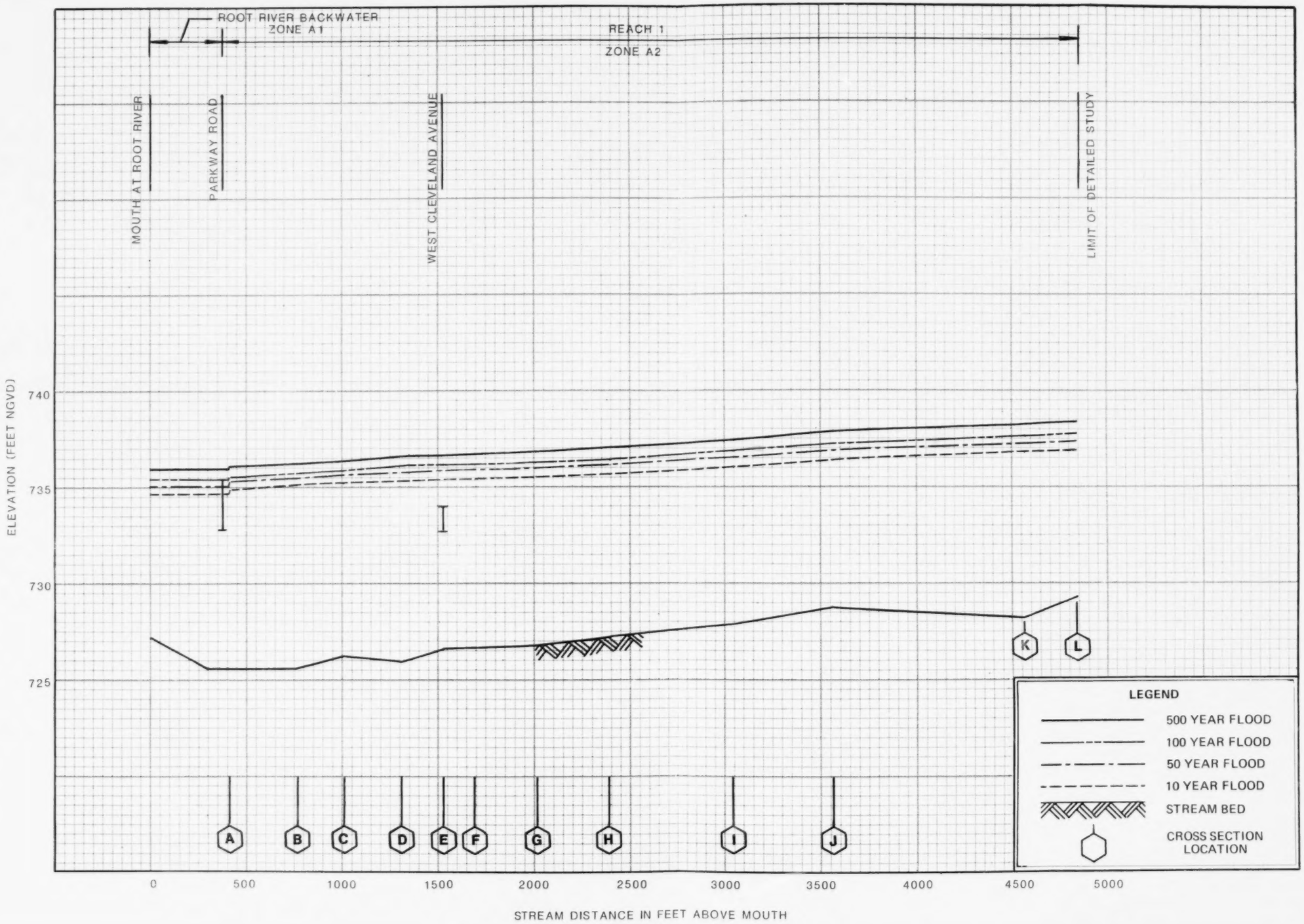
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF WEST ALLIS, WI
(MILWAUKEE CO.)

FLOOD PROFILES

WEST BRANCH ROOT RIVER



FLOOD PROFILES

HALE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF WEST ALLIS, WI
(MILWAUKEE CO.)

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